Paper P5-1	***Recent and Current CSFII Methodology Research***
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RECENT AND CURRENT CONTINUING SURVEY OF FOOD INTAKES BY INDIVIDUALS (CSFII) METHODOLOGY RESEARCH.

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ABSTRACT

The U.S. Department of Agriculture (USDA) has conducted national surveys of dietary intakes of individuals since the 1960's. Research to improve the methods for obtaining information on dietary intakes has been a vital component of survey-related activities. In preparation for the 1994-96 Continuing Survey of Food Intakes by Individuals/Diet and Health Knowledge survey (CSFII/DHKS), USDA sponsored collaborative research in two key areas: (1) a are view of the CSFII individual intake questionnaire by the Center for Surveys Method Research (CSMR) of the Census Bureau and research on the cognitive aspects of the 24-hour recall, and 92) a review and pretesting of the DHKS questionnaire by the demographics Survey Division of the Census Bureau. Cognitive interviews identified strategies employed by respondents to recall foods eaten on the previous day. This research led to the development of the multiple-pass approach for the 24-hour recall used in the 1994-96 CSFII. The pretesting of the DHKS resulted in improvements in t he structure of t he questionnaire and reduced respondent burden. A follow-up study focused on improving the reporting of intakes by children. Current research is focused in three areas: (1) cognitive testing of the DHKS by CSMR; (2) research on portion size estimation by Tennessee State University; and (3) development of methods for estimating distributions of usual food and nutrient intakes by Iowa State University.

This paper reviews methodological research sponsored by the Agricultural Research Service of the U.S. Department of Agriculture in support of the Continuing Survey of Food Intakes by Individuals (CSFII). Staff of the Food Surveys Research Group of the Beltsville Human Nutrition Research Center have directed and contributed to this research.

The research is part of the National Nutrition Monitoring and Related Research Program. Nutrition monitoring provides data for public policy decisions on issues related to nutrition education, food assistance programs, food regulatory activities, and public health programs, as well as for establishing future research priorities.

The Ten-Year Plan for Nutrition Monitoring and Related Research, developed in 1992, addresses the need for continued monitoring of food and nutrient intake and dietary attitudes and knowledge (Dept. of Health and Human Services and Dept. of Agriculture, 1993). Specific activities in the plan call for methodological research to improve the validity and reliability of dietary intake data. Earlier methodological research studies have been reported by Pao, Sykes, and Cypel (1989). Our continuing research and development efforts are aimed at meeting monitoring needs by improving the quality of dietary information on the U.S. population.

Cognitive Research on the CSFII Questionnaire

The first of the recent methodological studies we describe here was conducted by the Center for Survey Methods Research of the U.S. Bureau of the Census (CSMR). The major objective of this research was to use cognitive interviewing techniques to improve the CSFII questionnaire through

a better understanding of the thought processes used by respondents to answer questions. We wanted to learn how respondents understand the questions, formulate the answers in their minds, and then report their answers. If a difference was observed between what is intended by the question and what the respondents thought was intended by the question, changes could then be recommended.

This project was conducted in two stages. The first stage consisted of six interviews. The questionnaire was revised based on these interviews, and the modified questionnaire was then used in 11 interviews in the second stage. Subjects included military personnel, day care instructors, and high school and college students. Elderly individuals and young children were not selected as subjects. About half of the interviews were conducted at the cognitive laboratory at CSMR in Maryland. The remaining interviews were conducted in the subjects' homes and in a classroom at a local high school. Each interview took up to 2 hours to complete.

The cognitive interviews were conducted by a team of two interviewers. One interviewer was called the "nutrition interviewer" and had the responsibility of asking the survey questions as well as probing for adequate answers -- just as a regular field interviewer would. The second interviewer was called the "cognitive interviewer." This person had the responsibility of keeping the subject thinking aloud. This could mean the use of a hand gesture or a subtle comment to "keep talking." If the respondent used a phrase which was vague or unclear, the cognitive interviewer would follow-up with a probe for the meaning. Also, if a term was used in a survey question that might be open to different interpretations, the cognitive interviewer would ask the subject what he or she thought it meant.

The cognitive interviews showed that respondents remembered what they ate in very different ways. Some respondents listed meals first and then reported snacks. Others reported food chronologically. While some began at the beginning of the day and worked forward, others began at the end of the day and worked backwards. Most respondents recalled foods eaten by associating them with activities rather than with the time of day.

Based on findings from the cognitive interviews, CSMR made recommendations on the flow of the questions on food intake to focus more on what foods were eaten. Another recommendation was to have the respondent recall what he or she ate in several different ways.

Additional information on this research and the procedures eventually used in the 1994-96 CSFII will be provided in the Design and Operations Report currently in preparation (Cypel and Tippett, 1996).

Improving Reporting of Food Intake Data by Children

The second methodological study was conducted at the University of Maryland's Survey Research Center (SRC) in College Park. The objective of this study was to recommend modifications to questionnaire designs and interviewing strategies for 6- to 11-year-old children. These researchers felt that the CSFII Day One questionnaire's wording and structure were too complex for school-age children and that alternative interviewing strategies should be developed to aid children's recall processes. After conducting a few pretests, Center staff proposed and tested three alternatives to the reference protocol.

The first alternative protocol was based on a meal/nonmeal format in which children were asked what foods and beverages were consumed at each meal and between meals. The assumption was that the memory of foods one has eaten may be organized by regular meals. In the second alternative protocol, children were asked to recall foods and beverages by location. Interviewers first asked children where they consumed the foods and then what was consumed. The SRC researchers believed that reporting about what one did on the previous day may be a more natural and engaging task than trying to remember a list of foods eaten and may be a good trigger for remembering foods eaten. The third alternative was an open protocol. Children were free to use

any means to recall items consumed without the possibly inhibiting task of answering a series of formal questions. The reference protocol was an abbreviated and reformatted version of the CSFII 1989-91 Day One questionnaire. The alternative protocols were compared to the reference protocol.

A total of 36 subjects was recruited through local day-care centers or summer programs and random selection by telephone. Children were then randomly assigned to one of the four protocols. The children, without the assistance of an adult, reported their intake during interviews conducted at SRC. The interviewers used several techniques in all of the protocols to obtain more complete information from the children.

All children, parents, and interviewers were debriefed to get their reactions to the protocols. Debriefing questions were asked about comprehension, areas of difficulty, and why certain foods were not reported.

The CSFII Day One or the reference protocol took the longest to complete--23 minutes; the mean time for the open protocol was the shortest--13 minutes. All of the alternative protocols yielded greater numbers of food items reported on average than the reference protocol, although the differences in the numbers of food items reported among all protocols were small. The results from this study provide a good start for continued research and field testing of methods of collecting food intake data from children.

Further Cognitive Research on the Intake Questionnaire

Following the University of Maryland study, we asked CSMR to conduct another round of cognitive research focusing on: 1) improving the reports by children; and 2) obtaining more complete reports of food intake by subjects of all ages. We also targeted a few points in the 1994 CSFII instruments and procedures that we thought might benefit from additional work.

In this study, most of the cognitive interviews were conducted in subjects' homes. This allowed for some validation of responses, especially on food label information. Children 6 to 11 years old answered for themselves and were assisted by a parent during the interview. In addition, parents were asked about why they thought their children answered as they did and about their perceptions of the accuracy of their children's responses. Based on their findings, CSMR recommended that the introduction to the 24-hour recall be modified to inform both the parent and the child that the task is a joint one and that they need to work together to provide the best information. They also recommended that the standardized introductory statement used with all respondents be modified to include a specific statement of the main objective of the survey to motivate more complete reporting.

We had asked CSMR to investigate whether or not respondents could provide more details on how foods were prepared, especially with regard to salt and fat. They recommended that such probes be asked only of respondents who had prepared the foods. On the other hand, they recommended getting more details from labels by adding a standardized probe in appropriate places, saying "Please check the label and tell me..."

Recommendations included some revisions to the questions on plain drinking water and to the list of sources of foods. The research by CSMR from this phase will serve as a resource for USDA staff working on future surveys.

Cognitive Testing of the Diet and Health Knowledge Survey (DHKS)

USDA nutritionists wanted to learn how respondents interpreted the 1994-96 DHKS questions and identified concerns with some of them. We were also interested in exploring whether a “don’t know” response option should be made explicit for some questions. The literature suggested that providing a “don’t know” response option reduces the random error that occurs when people are

forced to guess and select one of the provided responses. We were also concerned that the lack of an explicit “don’t know” might increase the perception of the questionnaire as a test. We wanted to learn how respondents interpreted specific questions and key terms, such as “healthy” and “serving.” We also wanted to investigate the type of response options best suited to the DHKS.

After listening to taped interviews and considering USDA concerns, CSMR revised some questions and added some explicit “don’t know” response options. They also added an introductory statement explaining that "don't know" answers were acceptable. In phase I of the cognitive testing, ten interviews were conducted to test the explicit “don’t know” options and to determine how respondents comprehended the questions.

The researchers found that respondents answered “don’t know” when they did not understand terms, such as "saturated fat," and when they did not have the knowledge to answer a question, such as "Which has more fat, yogurt or sour cream?" CSMR, therefore, believed that allowing an explicit “don’t know” response was appropriate for knowledge questions; however, the “test-like” feel of the questionnaire was not markedly diminished as had been hoped.

In phase II, CSMR is investigating which of two types of response options are best suited to the DHKS--response categories or anchored scales. We expect to apply many of CSMR's recommendations as we revise the DHKS for future use.

Research on Portion Size Estimation Aids

Both USDA and the National Center for Health Statistics of the U.S. Department of Health and Human Services (NCHS) use measurement aids in their food consumption surveys to help respondents estimate portion sizes of foods they consumed. Other nutrition researchers have used a variety of measurement aids.

Despite the wide use of measurement aids, research is lacking on their reliability and validity (Cypel, Guenther, and Petot, 1996). There is limited information on the usability of specific aids by the general population and population subgroups, particularly in 24-hour dietary recalls. Information on cognitive processing is also lacking for portion size estimation. This cognitive processing requires further investigation because it may contribute to errors associated with portion size. Such research may provide clues as to how portion size estimation procedures and aids might be improved for use in 24-hour dietary recalls.

USDA is supporting collaborative research to study portion size estimation in dietary recalls through a Capacity Building Grant with Tennessee State University (TSU). Other collaborators in the development of this research proposal included Government agencies involved in dietary methodology research: the Western Human Nutrition Research Center of USDA, NCHS, and CSMR of the Bureau of the Census. A psychologist at Kansas State University (KSU) is also a collaborator.

The purpose of the study is to examine portion size estimation methods in 24-hour dietary recalls. The research is divided into three stages, each with a defined goal. In Stage 1, we are examining the cognitive processes involved in using portion size estimation aids in 24-hour dietary recalls. We are using cognitive interview techniques to examine the recall strategies used by respondents when making portion size judgments and how respondents use various types of portion size estimation aids when making judgments. In Stage 2, we will assess the accuracy with which these aids are used and will determine which aids seem most promising for future field testing. In Stage 3, we will evaluate accuracy of two methods of reporting size: the use of descriptive terms (such as small, medium, and large) versus the use of dimensions.

Research on Estimating Distributions of Usual Intakes in a Population

More than a decade ago, USDA commissioned the National Academy of Sciences (NAS) to investigate the question of how to assess the adequacy of nutrient intake for a population. We have been working cooperatively with researchers at Iowa State University (ISU) to implement the approach outlined in the NAS report (Subcommittee on Criteria for Dietary Evaluation, 1986). This research was presented at this conference a couple of years ago and is discussed only briefly here (Guenther, 1994).

The centerpiece of the approach is a measurement error model that treats the intake observed for any individual on any given day as the sum of that individual's true usual intake and a random "disturbance" or "measurement error" for that individual on that day. We favor this approach because we assume that an individual can more accurately recall and describe the types and amounts of foods eaten yesterday than the types and amounts of foods eaten over any longer period of time.

The method developed at ISU controls the day-to-day variability of nutrient intake. Consequently, it requires a minimum of 2 independent days of food intake information or 3 consecutive days for at least a subsample of individuals. The method also addresses the problems of skewed intake distributions and complex survey designs. Because normal distributions are not required, intake values that are extreme, but perhaps valid, need not be discarded. A technical paper by Nusser, Carriquiry, Dodd, and Fuller (1996) describes the method in detail.

The research first focused on distributions of usual nutrient intakes. The current research builds on the earlier work and extends it to the estimation of usual intake distributions for foods or food groups (Nusser, Fuller, and Guenther, 1996). This research has to solve the additional problem of the high fraction of zero intakes in the food intake data. The zeros come from people who never consume the food and from people who do consume the food but did not do so any of the surveyed days. The approach used involves modeling an individual's usual intake on days that the food is consumed multiplied by his or her probability of consuming the food on any given day. When there is a sizable correlation between the frequency of consumption and the amount consumed in one day, a more complex modeling approach will be required.

Conclusion

A great deal of preliminary work is needed to develop a dietary intake survey questionnaire. Additional evaluation and field testing of research recommendations will be needed.

The outcomes of these collaborative efforts will contribute to improvements in the development of future USDA food consumption surveys. We also expect benefits for the Nutrition Monitoring and Related Research Program in general through (1) coordinated use of resources, (2) increased survey comparability, and (3) enhanced data quality. As nutrition researchers, we can all benefit from a better understanding of the cognitive processes our subjects use when responding to our dietary assessment questionnaires as well as new statistical approaches for using the data more efficiently and effectively.

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